APPLICATION VOID.

This print shows the Specification as it became open to public inspection under Section 91 (4) (a) of the Patents and Designs Acts, 1907 to 1938.

PATENT SPECIFICATION

Convention Date (Germany): July 4, 1936. **503,211**

Application Date (in United Kingdom): June 26, 1937. No. 17886/37.

Specification not Accepted

COMPLETE SPECIFICATION

Improvements in or relating to Secondary Electron Multipliers

We, Zeiss Ikon Aktiengesellschaft, a Joint Stock Company organised under German law, of Schandauer Strasse 72/80, Dresden A.21, Germany, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The present invention relates to improvements in or relating to secondary electron multipliers, especially for sound film and television purposes.

In known secondary electron multipliers operating on the electrostatic principle, the electron pencil to be multiplied was successively led on to a number of electrodes, spacially separated from one another, and having secondary emissive layers. The counter-electrode producing the acceleration of the electrons liberated at the secondary emissive layers likewise consisted of a number of individual electrodes spacially separated from one another. The construction of the multiplier is naturally complicated by the use of this relatively large number of electrodes.

It has now been found that the known secondary electron multiplier can be simplified if a single electrode is used instead of spacially separated electrodes. The same applies to the counter-electrode.

According to the present invention we provide a secondary electron multiplier, especially for sound film and television purposes, in which the secondary emissive layers on to which the electron pencil to be intensified is successively led are carried on a common carrier and a single electrode is provided as the acceleration electrode, accelerating fields being produced between the two electrodes by a potential gradient along the length thereof.

In order that the invention and the advantages thereof may be well understood some embodiments will now be described by way of example with reference to the accompanying drawings.

Referring to the drawings, Figure 1 shows a secondary electron multiplier having a housing 1, preferably made of ceramic material. The multiplier consists of the following essential parts: an electrode 2 provided with a secondary emissive layer 3, an acceleration electrode 4, a light transparent window 5 constructed as a photocathode, a protective grid 7 and a receiver 8. The secondary emissive electrode 2 consists of a semi-conductor 2 (carbon, slate etc.) which serves as carrier for the secondary emissive layer 3, for which a caesium-silver oxide layer is preferably used. The counter-electrode 4 serving for the acceleration of the electrons liberated at the secondary emissive layer likewise consists of a semi-conductor such as carbon, slate etc. A potential difference is applied across the ends of the electrodes 2 and 4 so that this potential gradually increases in positive sense along the electrode surfaces towards the receiver 8. The potential which is applied to the electrode 4 is such that of oppositely disposed points of the electrodes 2 and 4 that in the electrode 4 is positive with respect to that in the electrode 2. Under the influence of the accelerating field and of a magnetic field the electrons can then be led approximately along the path 6 so that they impinge several times upon the secondary emissive layer 3, are intensified and finally reach the receiver 8. In order to prevent divergence of the electron pencil along the path 6 a plate 9 concentrating the electron pencil is preferably arranged along each side of the secondary emission cathode 2, as shown diagrammatically in Figure 2. The plates 9 preferably consist of glass, mica or other such materials which, by their negative charge, prevent divergence of the electrons.

The secondary emissive cathode 2 can, if desired, be constructed as shown in Figure 3, in which the secondary emissive

[*Price* 1

layer applied to the carrier is divided, for example by scratches, into individual surfaces 10 between which lie narrow surfaces of semi-conductor 11. By means of such a construction of the secondary emissive cathode, individual electrodes can be produced in simple manner on a common carrier, without the disadvantages of spacially separated individual electrodes.

In Figure 4 is shown a secondary electron multiplier which is distinguished from those shown in Figures 1 and 2 in that instead of the plates 9, concentration electrodes 12 are used, which, just like the electrodes 2 and 4, consist of a semi-conductor, to the ends of which a potential is applied. The potentials are such that in a cross-sectional plane, such for example as that of Figure 5, the concentration electrodes are negative with respect to the secondary emission cathode 2, whilst the electrode 4 is positive with respect to the secondary emission cathode 2.

In Figure 6 is shown a secondary electron multiplier which is provided with a cylindrical secondary emission cathode 13 having a secondary emissive layer 3. In the interior of the secondary emission cathode 13 is disposed a rod-shaped acceleration anode 14. In this case also semi-conducting substances, such as carbon, slate or artificial substances, can be used for both electrodes. The potentials which are applied to the electrodes 13 and 14 are such that electrons impinge several times with an energy of about 50 volts on the secondary emissive layer 3. This can be attained, as calculations show. Since the electrons, however, impinge nearly tangentially on the secondary emissive layer 3, the latter is roughened or formed step-wise as shown in Figure 7 so that the electrons impinge upon the layer at a greater angle of incidence.

The invention can also be carried out by arranging a grid, which serves as acceleration anode, between two plate-like plane electrodes which are both provided with a secondary emissive layer. The grid may consist, for example, of two semi-conducting rods as shown in Figures 6 and 7 which are arranged parallel to the plate electrodes and connected with one another by metallic conductors, for example wires. It may also be advantageous to arrange for a magnetic field to act additionally upon the electron beam. By suitably selecting the potentials the intensifying effect of the secondary electron multiplier can also be attained with such an arrangement.

It is also within the scope of the invention to use as secondary emissive layer one of a kind which has already been proposed for photo-cathodes. For making such a layer, a layer of caesium or rubidium is vaporised on to an antimony or bismuth layer and the layers are then subjected to a special treatment, for example a heat treatment, until the said two metallic layers have alloyed themselves with one another.

The invention is not limited to the embodiments described by way of example.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. Secondary electron multiplier, especially for sound film and television purposes, in which the secondary emissive layers on to which the electron pencil to be intensified is successively led are applied to a common carrier and a single electrode is provided as acceleration electrode.

2. Secondary electron multiplier as claimed in Claim 1, in which the carriers of the secondary emissive layer and the accelerating anode consist of a semi-conductor, for instance carbon or slate.

3. Secondary electron multiplier, as claimed in Claims 1 or 2, in which the secondary emissive layers are applied to the carrier as a coherent surface.

4. Secondary electron multiplier as claimed in any of Claims 1 to 3, in which the carrier for the secondary emissive layer is shell-shaped, for example cylindrical and the acceleration electrode is rod-shaped and is arranged in the interior of the carrier.

5. Secondary electron multiplier as claimed in any of Claims 1 to 3, in which a grid is arranged as acceleration anode between two plate-shaped electrodes provided with a secondary emissive layer.

6. Secondary electron multiplier as claimed in Claim 5, in which the grid consists of two semi-conducting rods which are connected with one another through metallic conducting wires.

7. Secondary electron multiplier as claimed in any of Claims 1 to 6, in which the secondary emissive layer is formed by vaporising caesium or rubidium on to an antimony or bismuth layer and then causing these layers to alloy with one another, for example by heat treatment.

8. Secondary electron multiplier substantially as hereinbefore described with reference to the accompanying drawings.

9. A method of operating the secondary electron multiplier claimed in any of the preceding claims, in which accelerating fields between the electrodes are produced by means of potential gradients along the length of the electrodes.

Dated this 26th day of June, 1937.

For the Applicants,
FRANK B. DEHN & CO.,
Chartered Patent Agents,
Kingsway House, 103, Kingsway,
London, W.C.2.

Leamington Spa: Printed for His Majesty's Stationery Office, by the Courier Press.—1939.

Fig.1

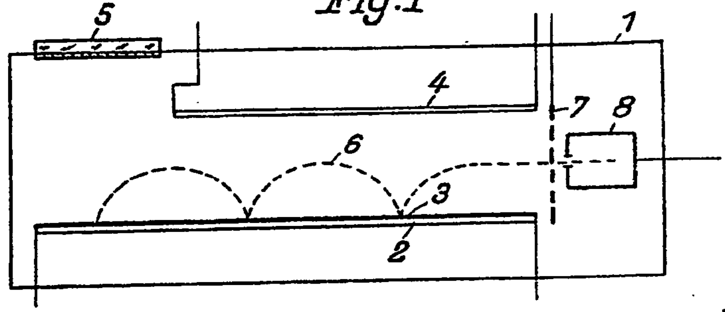


Fig.2

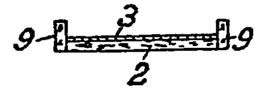


Fig.3

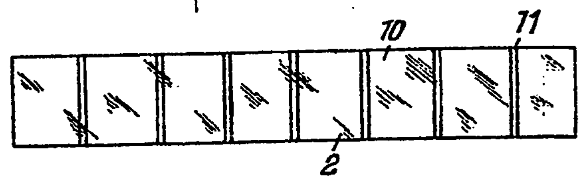


Fig.4

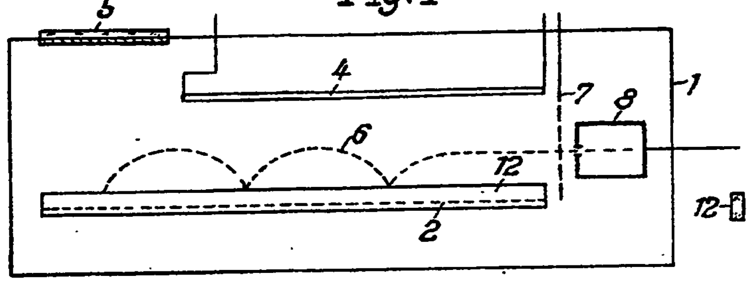


Fig.5

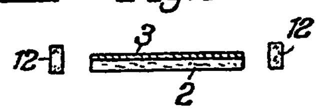


Fig. 6

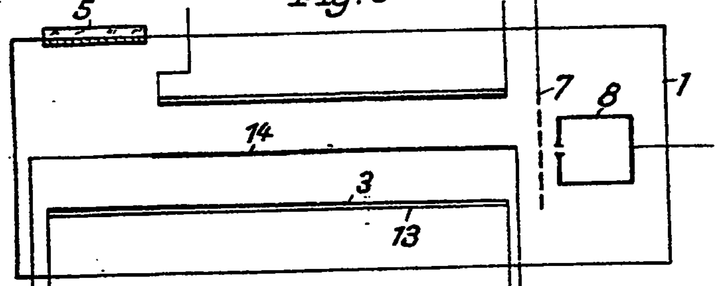
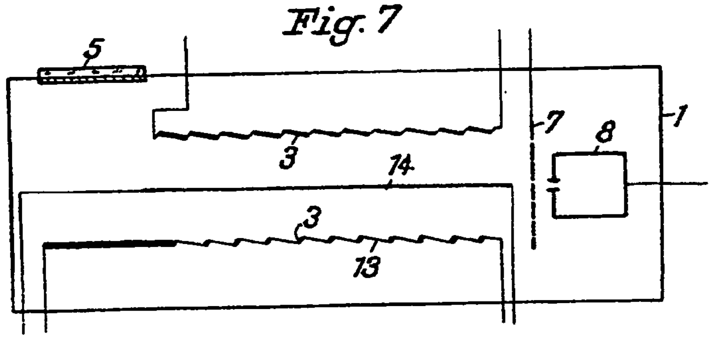


Fig. 7



Docket # PEK-In1257

Applic. # 10/718,777

Applicant: Kyek

Lerner Greenberg Stemer LLP
Post Office Box 2480
Hollywood, FL 33022-2480
Tel: (954) 925-1100 Fax: (954) 925-1101

Improvements in or relating to secondary electron multipliers

Publication number:	GB503211
Publication date:	1939-04-03
Inventor:	
Applicant:	ZEISS IKON AG
Classification:	
- international:	***H01J43/24;*** **H01J43/00;**
- European:	H01J43/24
Application number:	GB19370017886 19370626
Priority number(s):	DEX503211 19360704

Abstract of **GB503211**

503,211. Electron multipliers. ZEISS IKON AKT.-GES. June 26, 1937, No. 17886. Void. Convention date, July 4, 1936. [Class 39 (i)] Successive secondary cathodes are mounted on a common carrier and a single withdrawing electrode is provided. As shown, the multiplier comprises a ceramic envelope 1 with a photo-electric window 5, a secondary cathode surface 3 on a semi-conducting base 2, e.g. of carbon or slate, and a semi-conducting withdrawing electrode 4, and potential falls are created along the electrodes 2, 4. Glass, mica, or negatively-biassed semi-conducting shields may be arranged along the edges of the electrode 2. The surface 3 may be subdivided by scratches. In a modification, a cylindrical secondary-cathode may surround an axial withdrawing electrode. The secondary cathode may be roughened or formed with steps and may comprise caesium or rubidium vaporized onto an antimony or bismuth layer, the electrode being then heated to alloy the materials. In another modification, a withdrawing electrode between plane secondary emissive electrodes comprises semi-conducting rods joined by metal wires. A magnetic field acting on the electrons may be provided.

FIG. 1.